FINAL REPORT

POLICY ANALYSIS OF THE INTEGRATED COASTAL AND OCEAN OBSERVATION SYSTEM ACT OF 2009

IMPLEMENTATION AND PROGRAM DESIGN

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Columbia University | School of International and Public Affairs
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THE WORKSHOP IN APPLIED EARTH SYSTEMS MANAGEMENT

The following report consists of work completed over the past two semesters in the Workshop component of the MPA in Environmental Science and Policy Program at Columbia University's School of International and Public Affairs. Subsequent to the passage of the Integrated Coastal and Ocean Observation Act of 2009 (Act), this report focuses on the possible means of implementation for the Integrated Ocean Observing System (IOOS). Through working with the existing IOOS components and program design under the National Oceanic and Atmospheric Administration (NOAA), our group has developed an implementation plan for the Act.

The Workshop in Applied Earth Systems Management provides students with the opportunity to analyze an environmental public policy from time of introduction through its passage (or hypothetical passage if it is not signed into law during the timeframe of workshop). During the fall semester, students are asked to simulate the policy implementation of their assigned policy through skills gained in related program coursework.

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LIST OF ACRONYMS AND ABBREVIATIONS

DAC	Data assembly center
DMAC	Data Management and Communications
DIF	Data Integration Framework Pilot
GEOSS	Global Earth Observation System of Systems
GOOS	Global Ocean Observing System
H.R. 146	The Omnibus Public Land Management Act of 2009, Integrated Coastal and Ocean Observation System Act of 2009
ICOOS	Integrated Coastal and Ocean Observation System Act of 2009
IOOS	Integrated Ocean Observation System
IT	Information Technology
S.171	The Coastal and Ocean Observation System Act of 2009
MACOORA	The Mid-Atlantic Coastal Ocean Observing Regional Association, the Regional Association responsible for covering the waters from Cape Cod, Massachusetts to Cape Hatteras, North Carolina.
NGO	Non-governmental Organization
NOAA	National Oceanic and Atmospheric Administration
NORLC	National Ocean Research Leadership Council
NOS	National Ocean Service
PORTS	Physical Oceanographic Real-Time Systems
RA	Regional Association
RO	Regional Organization
RUCOOL	Rutgers University Coastal Ocean Observation Laboratory
QA/QC	Quality Assurance/Quality Control Officer
The Committee	The Interagency Ocean Observation Committee

EXECUTIVE SUMMARY

The oceans are the last unexplored frontier on Earth. In the past, the oceans have been viewed as limitless sources of food, transportation, and recreation, but in recent years the limits of the ocean resources have begun to be met. The need for better utilization and sustainable governance has become apparent.[i] Ecosystem changes over the past decades have exacerbated environmental problems related to climate change, biodiversity loss, and ocean-based threats. These environmental problems have global implications and make the need for legislation protecting oceans and the Great Lakes imperative. Portions of legislation have addressed marine resources since 1960; however, these have resulted in piecemeal data, not integrated to comprehensively analyze or manage oceanic conditions.

The Coastal and Ocean Observation System Act of 2009 was introduced to formally authorize funds to the existing Integrated Ocean Observation System (IOOS) run by the National Oceanic and Atmospheric Administration (NOAA). The IOOS is the United States' contribution to the Global Ocean Observing System (GOOS) and the Global Earth Observation System of Systems (GEOSS). In March of 2009, this Act became law under H.R. 146, The Omnibus Public Lands Management Act, as the Integrated Coastal and Ocean Observation System Act of 2009 (ICOOS). Promulgation of this Act now requires implementation of a program design that will coordinate the nation's ocean, coastal, and Great Lakes information systems.

The existing IOOS will act as a foundation to launch the fully developed system. Program design components that will further refine the IOOS include: the creation of a certification process to maintain the integrity of the IOOS, establishment of a grants and contracts system to fund regional IOOS efforts, and development of a data management and communications (DMAC) system to integrate and disseminate pertinent oceanic and Great Lakes data. These program design components will be administered by NOAA as the lead federal agency, and the Interagency Ocean Observing Committee (Committee), as established by the National Ocean Research Leadership Council (NORLC). The System Advisory Committee, to be established by NOAA, will advise the Committee and NOAA staff on an as-needed basis.

Implementation of this program design will require a comprehensive plan with a full staff, predominantly composed of existing NOAA personnel. These staff members will establish guidelines, protocols, and standards for the certification process, the grants and contracts system, and the DMAC system. The DMAC system will require the most resources of the program design components and, therefore, the creation of the DMAC system will be contracted to a third-party vendor. Preliminary budget estimates for the

first program year (2010) indicate that the program design components will require approximately $124 million dollars. However, revenue estimates from the Federal government show that only $27.5 million will be available for IOOS. Therefore, to account for the $96.5 million deficit, the budgets for staffing and personnel, regional grants, the DMAC contract, and other support services must be cut. Despite the limited funding, it is anticipated that the fully developed IOOS will still be operational by the end of 2010.

The Performance Management system will ensure that the IOOS runs effectively. The Performance Management Sub-committee will be created by the Committee to analyze performance using three methods:

- Measuring the percentage of certified Regional Associations (RAs) annually, a higher percentage will indicate a higher level of quality data collection;
- Quantifying the DMAC's data accessibility and usefulness to the Regional Organizations (ROs); and
- Identifying how efficiently the grants are being utilized toward data collection.

Based on the program design, including the staffing plan, budget, and Performance Management system, the priorities for program year 2010 are to:

1. Reorganize staff and make new hires for enhanced intra-agency and inter-agency communications and governance;
2. Create a standardized certification process for ROs;
3. Create a ranking and scoring process by which grants will be awarded to RAs and ROs;
4. Finalize standards for ocean data collection variables; and
5. Manage a contractor to begin the development of the DMAC system.

Successfully meeting these goals in program design implementation will assist regional organizations in conducting coastal and ocean research. This type of research is pertinent to addressing environmental problems related to climate change, biodiversity loss, and ocean-based threats. Access to this data is equally important for decision-makers creating policies to mitigate ocean-related issues, e.g., rising sea levels, fish kills, and coastal inundation. The Act serves as an integral step to comprehensively assessing and analyzing the global oceanic problems at a local level.

**For the purposes of this report, the observation system will be referred to as the IOOS, rather than the ICOOS, to maintain consistency with existing language; one exception to this is the case when the actual legislation (Integrated Coastal and Ocean Observation System Act of 2009) is discussed.

INTRODUCTION

Oceanic research is vital to the United States' national security, economy, and public health and safety. Two years ago, the Bush Administration cut the Education budget for the National Oceanic and Atmospheric Administration (NOAA) by 48 percent. This led to a decrease in funding for the Integrated Ocean Observing System (IOOS), the national pilot program working towards the integration and dissemination of oceanic data collected from organizations across the country. In January of 2009, Senator Snowe of Maine reintroduced the Integrated Coastal and Ocean Observation System Act – the fourth time the bill had been proposed, requesting additional funding and legal authorization of IOOS to enlarge and manage the base of information. Earlier this year, in March 2009, the bill was signed into law as part of the Omnibus Public Land Management Act.

The Act calls for the creation of an integrated system of ocean, coastal, and Great Lakes observing systems to meet regional and national needs for ocean information. Within the Act our team has identified two goals. The first is to enhance understanding of ocean-related environmental problems, specifically three critical oceanic issues in need of greater analysis: climate change, biodiversity loss, and ocean-based threats. Data collection is only part of the solution. The second goal is to foster communication among oceanic data collection agencies. Improved data communication will allow scientists to work with an expanded amount of scientific information and create more robust models of these pressing environmental problems.

If successful, the Integrated Coastal and Ocean Observation System Act of 2009 will ensure that scientists not only have a better understanding of the environmental problems affecting our nation, but that they are able to communicate this understanding to decision-makers in the hopes of mitigating the impacts of these problems. The standardized data collected by the IOOS will also facilitate integration into a larger international system to better inform policymakers worldwide on global climate issues.

This report presents a comprehensive plan focusing on the implementation of the Integrated Coastal and Ocean Observation System Act of 2009. The following analysis will outline the environmental problems addressed, the bill's proposed solution, key considerations to meeting the solution, and the ways in which the proposed program design supports the goals of the bill. The report will also discuss the operational structure necessary for successful implementation of the program design and how the effectiveness of the plan will be measured.

I. Environmental Problems Addressed

Although about three-fourths of the Earth's surface is covered by oceans, there is much left to learn about them. Changes in oceanic conditions over the past decades have highlighted three pressing environmental problems in marine and Great Lakes systems: changes in the climate system; a loss of biodiversity; and more intense and more frequent ocean-based threats. Each of these problems has the potential to significantly impact American lives and livelihoods on a massive scale. Global climate change, marine biodiversity loss, and ocean-based threats have brought to the attention of the nation's leaders the need for improved data collection, integration, and modeling systems.

Climate change is evident from observations of increases in global average air and ocean temperatures, widespread melting of polar snow and ice, and rising global average sea level. There is also evidence that global warming leads to biodiversity loss and more severe storms.[ii] Improved data management can help experts to predict weather events more accurately, and can help to better assess the status of coastal ecosystems, which many Americans rely on for their livelihoods. A better understanding of marine, coastal, and Great Lakes systems will equip agencies to prevent and mitigate risks rooted in these environmental problems.

Currently, federal agencies, including NOAA, are working to collect data targeting twelve core variables[1] to assess the state of our oceans. Scientists in government and academia have created modeling tools that utilize these data, enabling government agencies to predict and respond to climate change, marine biodiversity loss, and ocean-based threats. While data are being collected, the information cannot be utilized to its fullest potential unless data are uniformly integrated and disseminated to those that need it. By improving an integrated data sharing system, scientists will be able to better understand and predict environmental changes in oceans. Efficient coordination and dissemination of data will allow policymakers and decision makers to respond to urgent environmental problems through legislation or more timely action.

II. Proposed Solution: S.171, The Coastal and Ocean Observation System Act of 2009

The Coastal and Ocean Observation System Act of 2009 (S.171) proposes to address the three environmental problems we have identified (climate change, biodiversity loss,

[1] The 12 core variables are: salinity, temperature, bathymetry, sea level, surface waves, surface currents, dissolved nutrients, optical properties, ocean color, bottom character, pathogens, and dissolved O_2

and ocean-based threats) by strengthening and improving the current Integrated Ocean Observing System (IOOS) in order to better manage the nation's coastal systems and waterways.[iii] The Act's focus on the implementation of an integrated ocean observation system represents a step towards reaching the seven societal goals established by the Ocean.US[2] 2002 Workshop. These goals are to:

- Improve predictions of climate change and weather and their effects on coastal communities and the nation;
- Improve the safety and efficiency of maritime operations;
- More effectively mitigate the effects of natural hazards;
- Improve national and homeland security;
- Reduce public health risks;
- More effectively protect and restore healthy coastal ecosystems; and
- Enable the sustained use of ocean and coastal resources[iv].

S. 171 authorizes the National Oceanic and Atmospheric Administration (NOAA) to establish a "National Integrated Coastal and Ocean Observing System" and the National Ocean Research Leadership Council (NORLC) to create an Interagency Ocean Observation Committee (the Committee) in an effort to streamline and integrate communication and data management[v]. The national observing system will be an improved version of the already existing IOOS and will coordinate the nation's ocean, coastal and Great Lakes information systems. This will be achieved by mandating the standardization of scientific data and facilitating the dissemination of information to relevant federal and non-federal organizations, to ultimately improve natural disaster warning systems, oceanic environmental knowledge, and mitigation plans. The following section elaborates on the evolution of the bill, which lead to its passage in March 2009.

III. Political History of the IOOS

The need for an integrated data sharing system has been on the federal political agenda since the 1960s.[vi] The Marine Resources and Engineering Development Act of 1966 initiated marine policy objectives and created the Stratton Commission, which paved the way for federal ocean programs and the establishment of NOAA in 1969. Under NOAA and the National Ocean Partnership Program[3], the foundation of coastal research launched the wide-scale planning of the IOOS in 1997.

[2] Ocean.US was the National Office for Integrated and Sustained Ocean Observations, established in 2000 by Congress to facilitate the development of ICOOS

[3] The National Ocean Partnership Program (NOPP), established in 1997 by the National Defense Authorization Act, promotes the advancement of ocean knowledge in order to improve national security,

Today, the IOOS still serves as a component of NOAA and is composed of a partnership of federal, regional, and private-sector organizations. The information collected by these organizations is used to make decisions that safeguard U.S. coasts from ocean-based threats, enhance the economy, and protect the marine environment.[vii] However, education and research budget cuts to NOAA in 2007 imposed limitations on the capabilities of the IOOS system.

IOOS: Funding History

The IOOS was created with funding from the National Defense Authorization Act for Fiscal Year 1997. The Act mandated a requirement for the United States Integrated Ocean Observing System[viii] but failed to formally recognize the IOOS structure or to provide long-term funding options (See Figure 1). Following the funding allocations, there was a sequence of bills that took a piecemeal approach to addressing environmental problems associated with inefficient coastal and oceanic data collection. One of these bills was the Hydrographic Services Improvement Act of 1998, which authorized NOAA to design and install the Physical Oceanographic Real-Time Systems (PORTS). Another example is the Inland Flood Forecasting and Warning System Act of 2002, which maintained a system driver for data collection designed to increase storm prevention knowledge through data sharing.[ix] Although these bills addressed the issues of integrating or standardizing data, they were limited to a case-by-case basis.

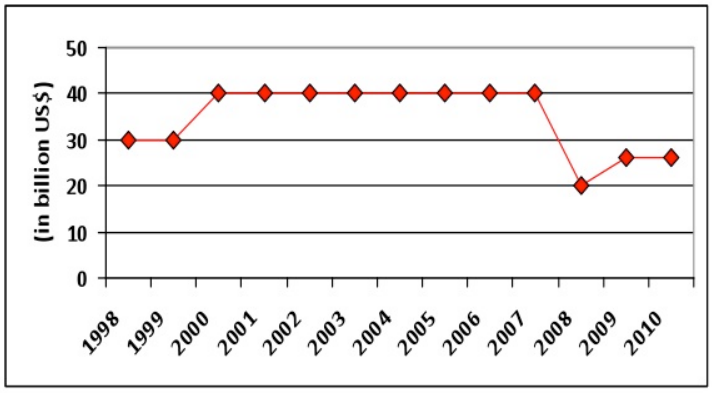

Figure 1: Yearly Funding Allocation of the IOOS

The need for a national integrated data system was brought to the forefront when the U.S. hosted the Earth Observation Summit on July 31, 2003. A political movement followed, pushing for official IOOS legislation in the U.S. as part of the country's contribution to the Global Ocean Observing System (GOOS). The standardized data collected by the IOOS will facilitate integration on a larger scale with the global systems. The GOOS is dedicated to improving weather forecasts and climate predictions as part of the larger Global Earth Observation System of Systems (GEOSS).[x]

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enhance economic development, protect the quality of life, and strengthen science education and communication. http://www.oceanleadership.org/files/NOPP%20Report%20to%20Congress.pdf

In 2007, the Bush Administration cut a large portion of NOAA's budget. The budget cuts negatively impacted the previously supported the IOOS program. As a result of the cuts, there was a 48 percent reduction of funds for education programs and scholarships,[xi] which represented the bulk of the budget for the IOOS. A funding strategy needed to be implemented as soon as possible to keep the IOOS in place.

Several attempts were made to recognize the IOOS as a federally required system and solidify a funding strategy for it. In 2004, the 108th Congress failed to pass the Ocean and Coastal Observation Systems Act of 2004 (H.R.5001) through the House subcommittee on Environment, Technology, and Standards. The following year the Ocean and Observation System Act of 2005 (S.361) passed in the Senate but died in the House subcommittee on Fisheries and Oceans.[7] It was introduced again in 2007 as S.950, the Coastal and Ocean Observing Act of 2007, and again in 2008 as H.R.2343; however, the legislation did not pass either year. It has taken several years of lobbying by supporters such as the National Federation of Regional Associations to draw attention to the need for IOOS legislation.[xii]

IV. Current Status of S.171

Senator Olympia Snowe (R-Me) introduced S.171 on the Senate Floor on January 8, 2009. The same day, the bill was sent to the Senate Committee on Commerce, Science, and Transportation. The House version of S.171, H.R. 347, was introduced under the same name the following day, before being incorporated as one of five pieces of ocean legislation added into H.R.146, The Omnibus Public Land Management Act of 2009. Subsequently, H.R. 146 was signed on March 30, 2009, during President Barack Obama's first hundred days in office.

Proponents of the Integrated Coastal and Ocean Observation System Act saw the large Omnibus Act as an ideal window for incorporation. Although the support of partisan efforts was important in passing this bill, timing played an integral role.[xiii] The refinement of the language and structure of the bill took place over several years, and had reached a stage where it was ready for congressional and executive support. Ultimately the bill passed as Subtitle C of Title 12 of the Omnibus bill. In the Omnibus bill the name of the Coastal and Ocean Observation System Act, S.171, was slightly changed to the *Integrated* Coastal and Ocean Observation System Act (ICOOS).

V. Key Considerations & Parameters for Program Design

Since the creation of the IOOS in 1997, NOAA has made great progress in administering an integrated coastal and ocean observation system even though the process has been

hindered by the lack of legal authorization and formal funding. With the passage of the Integrated Coastal and Ocean Observation System Act, NOAA has been given formal authority as the lead federal agency in implementation and management of the IOOS.

Existing Components of IOOS

Some of the major components mandated by the Integrated Coastal and Ocean Observation System Act are already in place due to the existing IOOS. Eleven *Regional Associations (RAs),* referred to in the legislation as regional information coordination entities, have been established in support of the IOOS to coordinate ocean and coastal research at the regional level through implementation of Regional Coastal and Ocean Observation Systems. [xiv] Each of the RAs is comprised of member *Regional Organizations (ROs)* that contribute to ocean and coastal observations at a local level. These organizations include state and local entities, academic institutions, private industries, non-profit groups and non-governmental organizations (NGOs).

What is lacking in the existing system, however, is a comprehensive data management and communications system (DMAC) that can effectively integrate and disseminate all these data. The Act provides the key tools needed to establish such a system.

General Requirements of the ICOOS Act

To officially establish a more comprehensive observation system, the Act authorizes the NORLC[4] to create the Committee to serve as the lead planning and oversight body of the IOOS. It also designates NOAA as the lead federal agency for implementation and administration of the IOOS.

Specific Requirements of the ICOOS Act

Because the IOOS is already fairly established, the legislation does not require the creation of completely new agencies, offices, or programs. The legislation requires tasks that are essential to integrating and improving the system from its existing components. These include supporting coastal and oceanic data collection, advancing technologies, ensuring data standardization, and building the physical infrastructure for a comprehensive DMAC system. Specific tasks that must be performed can be grouped into three areas: administration; oversight and enforcement; and science and technology.

[4] The National Ocean Research Leadership Council (NORLC), as established by section 7902 of title 10, United States Code.

VI. Organizational Structure

The Act defines a general organizational structure and the roles of agencies involved to ensure that the administrative, oversight, and technological tasks are completed in an effort to fully launch the IOOS. The general organizational structure defined in the Act is described below.

General Organizational Structure

As per the Act, oversight agencies in the organizational structure for the IOOS (Figure 2) will include the NORLC, the Committee, and NOAA. Additionally, the NOAA Administrator will appoint members to the System Advisory Committee, an entity required to provide advice on the IOOS as requested by NOAA or the Committee.

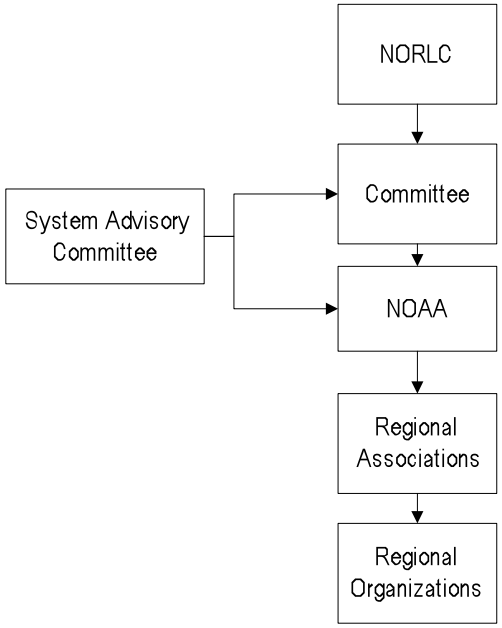


Figure 2: General Organizational Structure

NORLC

The NORLC is an existing cohort that will act as the policy-making and coordination oversight body for all aspects of the IOOS. Responsibilities include approving the IOOS budget, coordinating the IOOS with the GOOS and the GEOSS, and developing research and technology. NORLC comprises the heads of federal agencies involved in ocean research and policy (See Appendix A for a list of participating agencies).[xv]

Committee

The Committee will be formed from the existing Interagency Working Group on Ocean Partnerships. Committee responsibilities include budget preparation; establishment of required observation data variables, standards, and protocols for the DMAC system; development of RA certification requirements; and periodic review and management of the IOOS. The Committee comprises of representatives from the existing Interagency Working Group, including members of the NORLC and representatives from other research institutions collecting coastal and ocean data (See Appendix A for a list of participating agencies).[xvi]

NOAA

NOAA is the lead federal agency responsible for implementation as identified by the legislation. NOAA will coordinate the NORLC, the Committee, RAs and ROs. Since the pilot IOOS has been operational for several years, NOAA employees already have the experience required to implement the fully-developed IOOS. The Act requires that NOAA perform the following duties in its capacity as lead federal agency:

- Implement policies, protocols, and standards to certify and integrate RAs and ROs;
- Enter into and oversee contracts, leases, grants, and/or cooperative agreements;
- Develop and implement periodic review and evaluation of RAs and ROs; and
- Develop a data management and communications system.

Regional Associations

Eleven RAs will be involved in the coordinated efforts of the improved IOOS (See Figure 3). RAs are formed by geographically grouped ROs conducting research and collecting coastal and ocean data. Research efforts at RAs will operate independently from the stipulations of the Act.

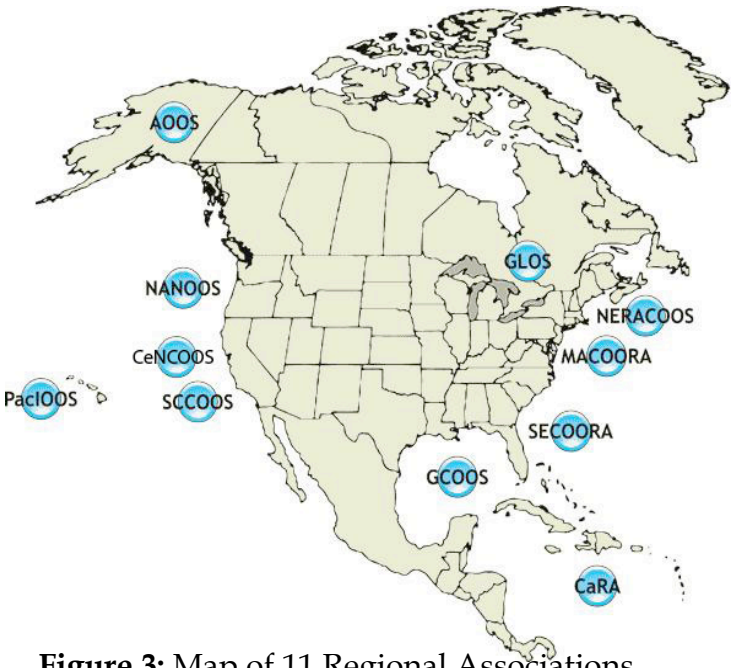


Figure 3: Map of 11 Regional Associations
Source: www.IOOS.gov

RAs will be involved in the initial system program design via the certification and grant/contract management processes detailed below. In the long-term, RAs will contribute to and utilize data from the IOOS. RAs will be periodically reviewed with the IOOS to ensure that data collection is consistent with the mission of the IOOS.

System Advisory Committee

The Act also requires the establishment of the System Advisory Committee to provide advice as requested by NOAA or the Committee. Members of this committee will be appointed by the NOAA Administrator and can come from either the public or private sector. Duties include administration, operation, management, and maintenance of the IOOS; expansion and periodic modernization and upgrade of IOOS technology; identification of IOOS user needs and the system's effectiveness; and any other purpose identified by the NOAA Administrator or the Committee.

VII. Program Design Options

Determining appropriate program options for implementing the fully-developed IOOS involves the analysis of: 1) the requirements specified by the legislation, 2) the components of the existing IOOS that are already in place and the degree to which those components are functioning and operational, and 3) the logical ways in which implementing new components could be carried out given the requirements of the legislation and the authoritative structure it authorizes.

In order to achieve a system in which regional data collection entities are contributing to and able to benefit from an integrated system, the legislation provides funds for the regions to perform oceanic observations that fulfill regional needs and also support the goals of the IOOS. Because NOAA has the authority to control where and how this funding is allocated, the options for implementation of the program design depend upon the way in which NOAA interacts with these groups and the level of control it

chooses to exert over the regions. NOAA could either implement the IOOS with strict federal authority and management over the RAs, or NOAA could choose to exert less control at the federal level, by giving regional planning, prioritization, and management responsibilities primarily to RAs. As a result, implementation of the IOOS could yield different results depending on the approach taken by NOAA and the Committee.

The demanding variety of tasks and potential impacts to management imply that a single, concrete approach cannot be used to address all of them. Control at the federal level is necessary for certain tasks while primary control at the regional level is appropriate for others. Since strict federal control could overwhelm resources and staff at NOAA but less federal control could overwhelm RAs and ROs, the selected program design strikes a balance among these agencies.

VIII. Program Design

Given the above considerations, the program design combines oversight at the federal level, as well as regional implementation authority. The program design relies upon the three areas of implementation previously mentioned: administration, oversight and enforcement, and science and technology.

Under these identified areas, the three major program design components that must be implemented to integrate the system include:

- Establishing a process for certifying and subsequently reviewing the regional entities to ensure the integrity of the DMAC system (Oversight and enforcement).
- Providing funding to regional entities to incentivize and enhance data collection and participation in IOOS through a grant and contracts system (Administration).
- Developing and subsequently managing a comprehensive DMAC system by which data collected from all System entities (federal, regional, and private) can be integrated, managed, and disseminated to end users (Science and technology).

The groups responsible for the organization implementation include: NOAA, the Committee, RAs and ROs.

Certification Process

The RAs and ROs will adhere to standards, protocols and best practices established by the certification process. This process will ensure that data collection pertains to the identified core variables. These core variables, mentioned above, were selected at the Ocean.US 2002 workshop and recommended for priority integration into the improved IOOS. Additionally, the methods by which data are collected must also be standardized to ensure validity and accessibility to all end users. NOAA will establish these

standards, protocols, and best practices based on the needs of ROs and federal agencies, with recommendations submitted electronically at http://ioosdmac.fedworx.org[5].

To establish the certification process, the following steps will be taken:

1. **Establish a Certification System for RAs and ROs**
   Responsibility: NOAA
   - NOAA will develop the standards for certification, to be approved by the Committee. Upon approval, RAs will apply to NOAA for certification. Minimum requirements for certification of both new RAs and new ROs include, but are not limited to:
     - A designated quality assurance/quality control (QA/QC) officer on staff to ensure the organization's compliance with data collection protocol
     - Information technology infrastructure and support staff capable of maintaining the organization's data for transfer to the IOOS
     - A professionally certified staff scientist or engineer to certify validity of data
   - Certified RAs will establish certification committees at each of their headquarters, which NOAA will train on the processes and standards, and the RAs, in turn, will be able to certify the ROs in their regions.
   - Organizations that have previously contributed to the existing IOOS will be granted certified status without going through this certification process, as they are already in compliance.
   - Certification will provide RAs and ROs eligibility to apply for grants and contracts from NOAA, the Committee, and other federal agencies.

2. **Implement a process for periodic review and evaluation of RAs and ROs**
   Responsibility: NOAA

RAs and ROs will be required to submit quarterly progress reports, with the caveat that funding can be halted if not in compliance with standards. See Appendix B, Figure b-1. Regional Association (RA) and Regional Organization (RO) Certification Process.

Grants and Contracts System

Currently, ROs and RAs have varying technological capability levels. Demonstrating successful data integration and dissemination through pilot projects will encourage private and public sector investment. These pilot-testing projects work to either target specific elements of the IOOS, such as sensors and models, or as product driven efforts to improve existing or create new products for the system.[xvii] In order to achieve the

[5] The U.S. also participates in international organizations including the Joint Intergovernmental Oceanographic Commission (IOC)/World Meteorological Organization (WMO) Technical Commission for Oceanography and Marine Meteorology (JCOMM) to standardize data formatting.

aforementioned societal goals, Ocean.US has identified areas for improving current operation capacity, including:

- Network of high frequency radar nodes for coastal current mapping nationwide;
- Gliders for water column profiling;
- Increase in temporal, spatial and spectral resolution of satellite based remote sensors for measurements of surface currents, waves, salinity, and phytoplankton biomass and pigment composition;
- *In situ* sensors for real-time measurements and data transmission of key biological and chemical variables; and
- Coupled physical-ecosystem models to enable ecosystem-based management.[xviii]

These will be the target areas for RA and RO grants and contracts funding. To establish the grants and contracts system, the following steps will be taken:

1. **Establish matching grant program (through participating federal agencies) for research, development, and operational deployment of new technologies**
   Responsibility: Committee

Certified RAs and ROs will submit grant proposals to the Committee for development and pilot testing of technologies that intend to enhance data collection needs of the region. The Committee will review these proposals and determine which federal agency can best assist in the research, development and operational deployment of new technologies.

2. **Develop a "merit-based" competitive funding process for grants to RAs and ROs**
   Responsibility: NOAA

Certified ROs will apply for grants through the existing grants.gov website. Instructions and application deadlines are outlined on this website. NOAA will be responsible for reviewing and administering grants and contracts to include demonstration projects to "design, develop, integrate, deploy, and support components of the system."[xix] Since funding is limited, NOAA will establish a system to score grant applications based on merit, and award grants based on score rank. The scoring and ranking of grant applications will take the following factors into consideration:

- The degree to which the proposed study or technology development is currently available (is there a similar technology available that can perform the same tasks?)
- The degree to which the proposed study addresses national and global information needs as well as regional needs
- The degree to which the proposed study fills in data or technology gaps in the existing observation system
- Urgency of technological need (i.e., whether a given region faces an imminent threat in the event of a natural disaster that justifies priority funding).

- Feasibility (do other scientists agree that a new technology, or data observation study, is possible and/or relevant?)

3. **Establish administrative procedures for allocating funds**
   Responsibility: NOAA

NOAA will be responsible for establishing procedures for fund distribution, including the allocation of grants and contracts. NOAA will distribute funds directly.

4. **Oversight of grants and contracts**
   Responsibility: NOAA

NOAA will establish a national method for overseeing contracts and grants, which will be passed down to the RAs who will be made responsible for ensuring the member organizations comply with these measures.

Grant and contract opportunities will be posted on NOAA's website. Member organizations will complete the NOAA application for grants or contracts. After being awarded funding for a project, the RAs will be responsible for submitting quarterly reports to NOAA detailing the progress of current and on-going grant/contract projects.

NOAA will review and evaluate the regional associations. NOAA will review grant allocations at five-year intervals ensuring original standards and procedures are met.[xx] See Appendix B, Figure b-2. RA and RO Grant and Contracts Application Process.

Develop a Comprehensive DMAC System

The DMAC system is the primary integrating mechanism of the IOOS and "begins the process of serving data and information needed to implement ecosystem-based management by integrating data on the physical environment with biological and chemical observations."[xxi] The functions of the system will include data transport, assembly and quality control, access, storage, archiving, and security.

The following steps will be taken to implement this program design component:

1. **Establish required observation data variables and identify priorities for system observations**
   Responsibility: Committee

In consultation with NOAA and other federal agencies, the Committee will decide upon the required observation data variables and system observation priorities. The Committee will also establish a council, which will solicit public comments from community stakeholders to gather input on primary ocean threats, and use this input to inform their decision. System variables and priorities may be based upon the data

variables and priorities designated by the current Data Integration Framework (DIF) pilot. The five DIF focus variables include seawater temperature, salinity, currents, ocean color, and sea/water level. These variables were selected both based on the availability of data sources and their ability to address four oceanic threats: coastal inundation, hurricane intensity, integrated ecosystem assessments, and harmful algal blooms.

2. **Establish protocols and standards for data processing, management, and communication**
   Responsibility: Committee

The Committee will use input from both NOAA and the ROs to establish data standards. To solicit RO input, the Committee will establish an electronic application by which ROs can nominate standards.

3. **Plan for integrating new technologies that have been demonstrated to be useful**
   Responsibility: The Committee, NOAA

The Committee, in consultation with NOAA, will establish a Technology Refreshment Plan by which regional technology will assessed. The Technology Refreshment Plan will also include a system by which technologies will be upgraded and changed as needed.

4. **Develop DMAC system for all data collected by all entities of IOOS**
   Responsibility: NOAA

NOAA will contract a private company to build a DMAC system based on the current DIF pilot, whose main objectives included: illustrating the measurable benefits of integrated data, improving the system by which data is integrated, and refining data standards to enhance any future oceanic data integration systems. Regional observing organizations will submit their data to data assembly centers (DACs). The DACs will then assess the data for quality control and send the data to the DMAC, which will then store the data. See Appendix B, Figure b-3. DMAC Implementation.

Case Study: RUCOOL

An example of the practical, real-life application of the Integrated Coastal and Ocean Observation System Act of 2009 can be seen by examining the research being conducted by an RO, Rutgers University Coastal Ocean Observation Laboratory (RUCOOL). RUCOOL is an RO supported by the Mid-Atlantic Coastal Ocean Observing Regional Association (MACOORA), which is the RA responsible for monitoring the waters from Cape Cod, Massachusetts to Cape Hatteras, North Carolina. This past April, this RO launched a trans-Atlantic glider, named after the University's mascot the Scarlet Knight. Piloted remotely by students at the University, the Scarlet Knight's 7-month journey marks the first of its kind as the first underwater robot to cross the Atlantic Ocean.

RUCOOL's participation in the newly improved IOOS will ensure that Rutgers scientists and students will have access to high quality, standardized data from a variety of ROs. Pairing Registry data with the data from the glider, these scientists will be able to create robust models of sea surface temperature changes in the Atlantic Ocean. But the system works both ways: hundreds of ROs will have access to the critical data the glider is currently collecting. Scientists involved in the project can easily access and analyze the data the glider is retrieving and communicating via satellite. Variables measured will include sea surface temperature, salinity, chlorophyll, and currents.

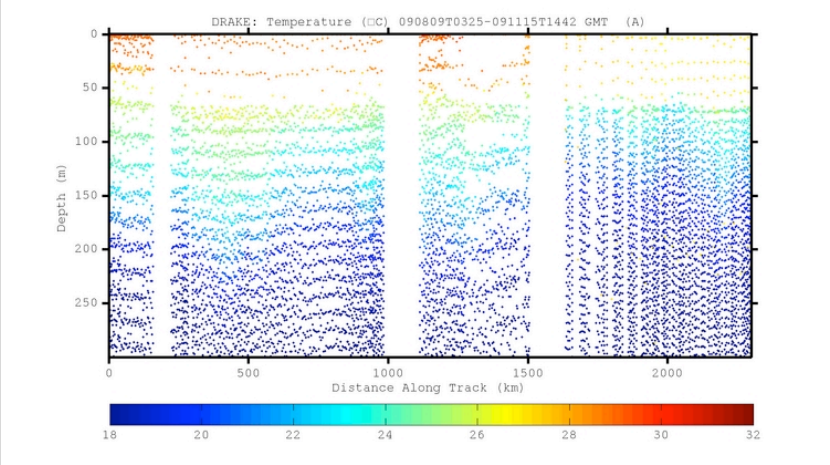


Figure 4: Temperatures collected at different depths and distances by the glider.
Source: www.obsregistry.org

The data collected will then be listed on the IOOS Registry online for public use and utilized to create models. For example, data, such as the temperature-depth profiles generated by the Scarlet Knight glider as seen in Figure 4 (above), can be used to create models (Figure 5) that help predict oceanic changes such as sea level rise due to thermal expansion of the oceans.

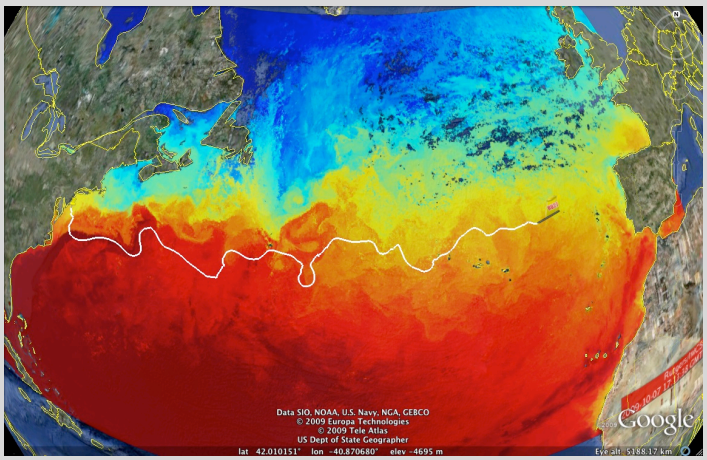


Figure 5: Model of water temperature created with data collected by the glider.
Source: www.obsregistry.org

For policymakers in the United States, knowing the degree of change in water temperature is critical, as a rise in coastal water temperatures could result in higher sea levels, causing coastal inundation, or more intense hurricanes, shutting down our public transit systems. As a result, the models can be used to influence the decisions of policymakers on how to mitigate the effects of the environmental problems addressed in the Integrated Coastal and Ocean Observation System Act (ocean-based threats, biodiversity loss, and climate change).

IX. Staffing Plan for the Major Program Design Components

Development of a staffing plan will determine the project timeline for implementation of the program elements. Since a pilot version of the IOOS already exists, the majority of required staff will be drawn from current NOAA and RA staff. As previously noted, passage of the Act requires that NOAA establish a process for certifying RAs, incentivize stakeholder participation by implementing a grant/contract management system, and develop a DMAC system. Development of these components of the Act will each require a comprehensive organization and staffing plan, as detailed in Figure 6.

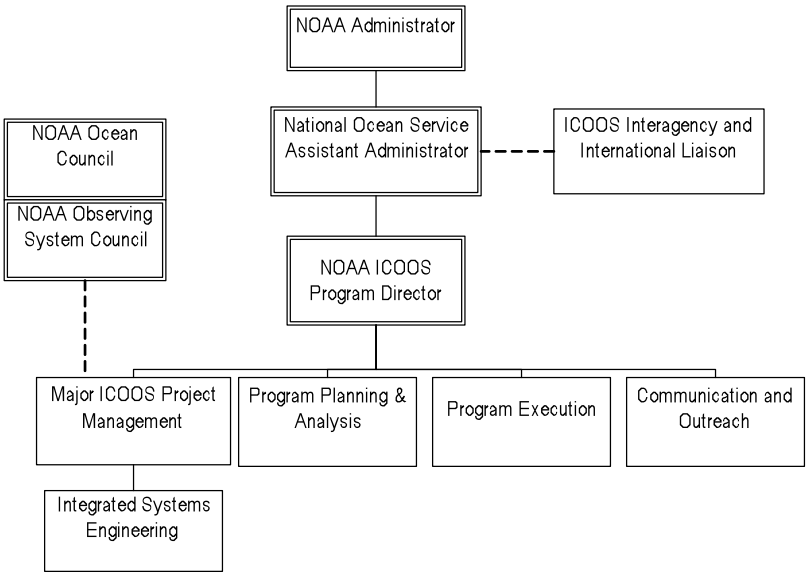


Figure 6: NOAA Existing IOOS Program Organizational Structure[xxii]

NOAA

The Act requires that NOAA establish an Integrated Ocean Observing Program office to oversee its responsibilities as the lead federal agency. This office will be staffed by those already involved in the pilot IOOS. Figure 6 (above) shows the organizational structure for NOAA's pilot program. Figure 7 (below) shows the organizational structure for the new Integrated Ocean Observing Program office. The new structure has been developed with consideration of the existing structure of the pilot IOOS program and the program design components identified above. The organizational structure will facilitate communication between and within NOAA, the Integrated Ocean Observing Program office, and the private firm responsible for developing the DMAC system. Key existing positions within the program are detailed in Appendix C.

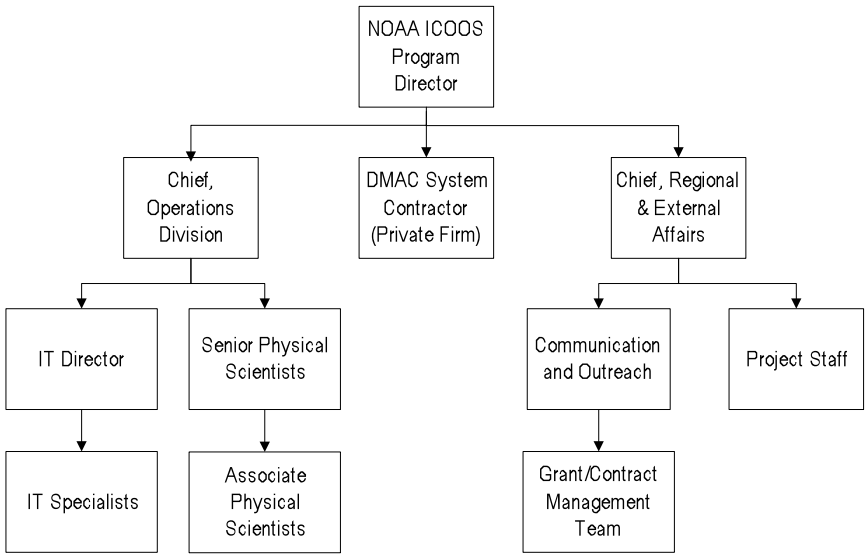


Figure 7: IOOS Program Office Organizational Structure

Major program design components include the RA certification process, the grant/contract management system, and the DMAC system. Due to the execution of the pilot program, experienced staff is readily available to implement a comprehensive data integration system to meet the objectives of the Act. It should be noted that the IOOS will require long-term operation, management, and maintenance components that are not detailed in this report. Staffing for these long-term tasks is not discussed here since the staff required for program design components may later operate in these capacities.

Certification Process

In order to properly develop the certification standards, NOAA will need a staff of nine scientists to establish guidelines and requirements that must be met by the RAs in order to be certified. Necessary positions for this task include five Senior Physical Scientists and four Associate Physical Scientists who will work to develop the standards and certify the validity of the data collected. This team of scientists will balance the need for experienced individuals to develop guidelines and requirements with the desire to train more junior-level staff to develop occupational skills. The NOAA Administrator will approve the final certification process developed by the NOAA scientists. Position descriptions for Senior Physical Scientists and Associate Physical Scientists are detailed in Appendix C.

Once the certification process has been established, the five Senior Physical Scientists from NOAA will become responsible for training RAs so they can properly certify ROs and provide oversight of regional activity. Utilization of these scientists is appropriate since they will be the most familiar with the certification requirements and, therefore, most prepared to train RAs. A QA/QC Officer will be included on the staff to ensure that the RAs and ROs adhere to the data collection guidelines set forth under the certification requirements. After the RAs have completed training, the Senior Physical Scientists will take on new projects within NOAA or work with the IOOS in different capacities, as oversight of the RAs and ROs certification processes will not be a full-time position.

After NOAA trains the RAs, Certification Committees will be created within each RA. The members of the committees will be representatives from existing RA member agencies and will be paid on a stipend basis, as this is not anticipated to be a full-time position.

Another staffing requirement that NOAA will need to meet in order to successfully implement the certification process includes hiring a team of Information Technology

(IT) Specialists. The team of IT Specialists will work throughout the Integrated Ocean Observing Program office to work on the infrastructure of the certification system in addition to maintaining the IOOS DMAC system. IT Specialists may be NOAA staff or may be contracted individuals hired on an as-needed basis. The team of IT Specialists will be integral in the success of the IOOS since they will be responsible for maintenance of the DMAC system. Position descriptions for IT Specialists are included in Appendix C.

Grant/Contract Management System

To ensure robust agency participation and innovative technological development in the IOOS, 11 full-time equivalent staff will form a committee to determine qualifications for grant recipients. This includes three Senior Grant/Contract Administrators, three Mid-level Grant/Contract Administrators, and five Junior Grant/Contract Administrators. The Grant/Contract Team will combine the experience of senior staff with the capabilities and lower pay scale of mid- and junior-level staff. The committee members could be comprised of existing NOAA staff already involved in grant distribution or they could be newly hired staff. Duties for committee members will include providing advice regarding grant/cooperative agreement processes and policies; establishing a merit-based system to score grant applications; reviewing grant applications; and distributing grants accordingly. Position descriptions for the grants management committee are included in Appendix C.

DMAC System

The pilot IOOS utilizes the DIF; however, this system will not have the capacity to support the expanded network of RAs and ROs that will participate in the IOOS. Additionally, NOAA does not have the staff or resources to develop a fully functional DMAC system, despite the pilot DIF. Therefore, NOAA will contract the development of the DMAC system out to a private firm. The Director of the IOOS program will act as a liaison to the private firm to ensure that the DMAC system meets the objectives of the Act.

In addition to working with NOAA, the contracted firm will also need to work with the RAs and ROs to determine how their respective data assembly centers will communicate with and contribute to the DMAC system. A one-month contract will be granted to a firm to establish the specifications and needs of the DMAC system. The deliverables from this contract will then be used to write the Requests for Proposals for the DMAC system. The firm's short-term analysis will help determine the exact infrastructure, software, and hardware needed to develop the DMAC system.

Other contractual duties of the private firm will include developing the DMAC system in accordance with the *Data Management and Communications Plan for Research and Operational Integrated Ocean Observing Systems* published by the National Office for Integrated and Sustained Ocean Observations in 2005. This requires that the DMAC system provide (1) IOOS-wide descriptions of data sets; (2) the ability to search for and find data sets, products, and data manipulation capabilities of interest; (3) the ability to access measurements and data products from computer applications across the Internet; (4) the ability to evaluate the character of the data through commonly-available web browsers; and (5) secure, long-term data storage.[xxiii]

The contract with the firm will be specifically for the development of the DMAC system and not for long-term maintenance of the system. A team of IT specialists will be required in NOAA's Integrated Ocean Observing Program office to maintain and expand the DMAC system as new technologies become available.

X. BUDGET

The following details of the program budget are based on the elements outlined in the Program Design, while taking into consideration the organizational structure and staffing plan requirements for the 2010 program year. This budget represents the funds allocated for the IOOS headquarters exclusively and not for the purposes of running the RAs or ROs.

Projected Total Budget

The budget of the IOOS aims to fund several aspects of the many costs associated with operating the Program Office headquarters, facilitating grants to the RAs, designing and implementing the DMAC system, and expanding upon existing federal agencies. The budget is divided between 4 different categories (See Figure 8):

1. **Administration:**
   Duties and Tasks: Daily operations, rent, travel costs, etc.
   Employees: 9 positions including the Director of IOOS, IT Director, the IT Specialists, Administrative Assistants, and the QA/QC Officer.
2. **Oversight and Planning:**
   Duties and Tasks: Scheduling, cost control, risk management, contract negotiations, program management, streamlining communications among the Interagency Working Group on Ocean Observations, and periodic review and evaluation of RAs and ROs.

Employees: 10 staff members including the Chief Director Of Operations, and the Senior and Junior Physical Scientists.

3. **Technical Operations:**

   Duties and Tasks: Develop the DMAC system, management of data archives, assimilation, engineering and conceptual design of the program, DMAC support services, and implementation of the DIF pilot program.

   Employees: All services will be contracted out to a private contractor.

4. **Regional Communications:**

   Duties and Tasks: Certification of the RAs, allocations of grant funds, collection and dissemination of information/data sharing between the headquarters and the RAs.

   Employees: 11 staff members including the Chief Regional Director, and the Senior, Mid-level, and Junior Grant Administrators.

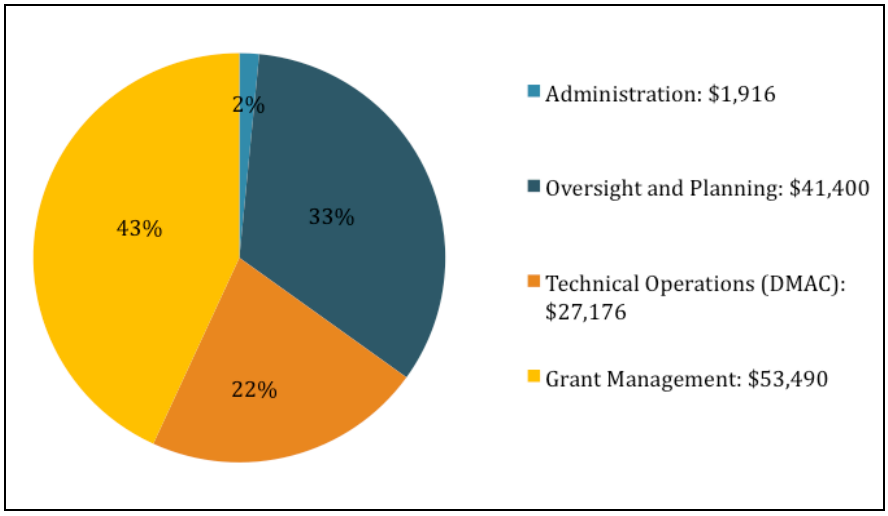


Figure 8: Total Costs of Program Design. (Numbers represented in thousands of USD)

Expenses for all four programs total $123,982,000 (See Appendix D).

Total Revenue from the Federal Government

The FY 2010 budget provides NOAA with $6.5 million of federal funding for the IOOS headquarters to implement the new DMAC system and $20 million in grants to the 11 RAs for technological advancements, research, and development. An existing earmark from Alliance for Coastal Technologies will provide an additional $1 million. With these contributions, it is expected that projected revenue will total $27.5 million (Table 1).[xxiv]

Table 1: Total Project Revenue

Contributing Revenue	Anticipated (in thousands of USD)
NOAA IOOS Federal Funding	6,500
Regional IOOS Federal Funding	20,000
Earmarks	1,000
Total Projected Revenue	**27,500**

While the Program Design outlined above has total expenses of nearly $124 million, the actual revenue appropriated to the program by the federal government falls well below that, creating a deficit shortfall of nearly $96.5 million.

Total Budget for Year 1 of Implementation (Program Year 2010)

With a budget deficit of nearly $96.5 million, in order to implement the DMAC system and cover the 1st year of expenses, the following budget cuts are necessary:

- $2,176,000 in contracted staff for DMAC
- $12,038,000 in DMAC design and software ($10 million was taken from regional grants and $38,000 taken from supplies)
- $450,000 in IT services
- $360,000 in Administrative personnel
- $900,000 in Oversight/Planning personnel
- $576,000 in rent
- $10,000 in supplies
- $990,000 in regional personnel
- $10,000,000 in regional grants

These cuts were determined based on the prioritization of tasks that need to be done in the first year. Because DMAC is the most important component of the new system, the majority of funding will be primarily allocated here and secondarily to RAs for data collection activities. To compensate for some of these costs, RAs will be required to apply more aggressively for funding from private sector grants and academia partnerships for technological advancements, research, and development. These costs total the deficit value of $96,482,000 and will allow the DMAC system to be implemented and to run the IOOS headquarters office.

XI. Performance Measurement

This section focuses on the management tools and indicators to monitor the bill's

effectiveness at improving a data integration system, and improving interagency communication to respond to environmental problems. The following performance metrics will evaluate the success of the program design's major components. The certification process, grants and contracts systems, and the DMAC system will each be evaluated to assess whether the goals specified below have been achieved. For the bill to be successful, the Committee must establish a Performance Management Sub-Committee (Sub-Committee) responsible for analyzing performance in three areas:

- Measure the percentage of certified RAs annually, a higher percentage will indicate a higher level of quality data collection
- Quantify the DMAC's data accessibility and usefulness to the ROs
- Identify how efficiently the financial grants are being utilized toward data collection

The following outlines these metrics in greater detail.

Measuring the Percentage of Regional Organizations Certified

Following the implementation to the program design, the Sub-Committee will certify a certain number of ROs annually to ensure that the goal of 100% of organizations certified is met by year 5 (Program Year 2015). Every six months, the Sub-Committee will measure and analyze the number of organizations, which have been certified as ROs (See Appendix E, Table e-1). The Sub-Committee will calculate the total number of ROs by determining both the number of certified organizations and the number of organizations currently involved in the certification process. This measurement will help the Committee track the effectiveness of the certification process as well as certify a maximum number of ROs within the given 5-year timeframe. Certifying ROs will increase the number of organizations eligible for grants, streamlining the grants application process, as well as ensure that the data entering the DMAC system is standardized.

Survey Accessibility and Usefulness of DMAC System to Certified ROs

Surveys will be conducted to determine the satisfaction levels of the ROs with the DMAC system. Achieving the five-year goal of a 100% average of "satisfied" (average rate of satisfaction of 4 out of 5) ROs indicates that the DMAC system is accessible and useful to certified ROs (See Appendix E, Table e-2). With a greater understanding of the coastal and ocean environmental problems, certified ROs can then assist decision makers in mitigating the impacts of these problems. Measuring the success of mitigation will prove challenging, both because it is difficult to assess whether mitigation is a possibility for many coastal and ocean problems and because mitigation is a long-term goal. It is, however, possible to measure the success of the DMAC system by evaluating the ease of accessibility of information and the ways in which this

information is being used. Measuring these variables will inform the Committee's understanding of whether the DMAC system is in fact improving RO understanding of oceanic environmental problems.

To gauge the accessibility and usefulness of the DMAC system, the Committee will require the Performance Management Sub-Committee to design a survey to assess customer satisfaction with the DMAC system. Certified ROs will be required to submit a survey every six months. The survey will cover data accessibility, DMAC data organization, data standardization, and data modeling, and would be divided by both core variable and environmental problem.

To identify how efficiently the grants are being used toward data collection, the Sub-Committee will take inventory of the ROs' equipment in order to measure the annual percentage increase in the current operation capacity. A benchmark will be set of at least a 25% annual increase in operational capacity. To ensure that each RO has 75% new or updated technology over a 5-year timeframe ensures maximum technology updates within the allocated funds given to the ROs (See Appendix E, Table e-3). The remaining 25% of updates will be achieved over a longer timeframe to ensure a 100% of updated technology for all ROs. Monitoring the extent to which awarded grants and contracts are being spent on new or updated technologies will allow for measurement of how effectively the funds are being allocated.

Overall, the performance indicators outlined above will provide necessary feedback for each component of the program design in order to ensure the overall effectiveness of the legislation. With the immediate creation of the Sub-Committee, the indicators listed can begin to be measured. This will allow for an idea of how well the environmental issues outlined in The Integrated Coastal and Ocean Observation System Act of 2009 are being addressed and isolate areas where improvement is needed.

Performance management indicators consist of four components; measurement, collection, reporting and feedback. In order to ensure the success of the three performance management indicators listed above, these components need to be outlined to track the overall efficiency of each indicator (See Appendix E, Table e-4).

XII. Master Calendar

The program design has been created so that implementation of the IOOS program during the first year, Program Year 2010, would set the framework for subsequent years when the IOOS will be used to its fullest capacities. The master calendar for the IOOS Program Year 2010 incorporates the task calendars for the main areas focused on in the

program design: Administration, Certification Process/Grants Management, and the DMAC system. Determined by the program design and staffing plans, the priorities for the first program year of the IOOS under the new legislation are:

1. Reorganize staff and make new hires for enhanced intra-agency and inter-agency communications and governance
2. Create a standardized certification process for ROs
3. Create a ranking and scoring process by which grants will be awarded to ROs
4. Finalize standards for Ocean Data Collection Variables, and
5. Manage a contractor to begin the development of the DMAC system.

The implementation of these tasks can be seen in Appendix F.

Based on the priorities set above, by the end of the Program Year 2010, the following will be established:

- Certification process
- Grants distribution process
- Standards for ocean data collection variables
- Requirements for DMAC
- DMAC development, testing, and use underway
- Performance measurement surveys
- Improved IOOS communications

Considering the program design and the complementary master calendar set forth, the IOOS will be able to accomplish the goals set for Program Year 2010 by the end of the year. The development of the DMAC system will be ongoing into Program Year 2011.

XIII. CONCLUSION

On March 30, 2009, the Integrated Coastal and Ocean Observation System Act of 2009 was incorporated into H.R 146 Omnibus Public Land Management Act and signed into law by President Obama. This passage represented the fruition of years of work by supporters of this bill. The intent of the bill is to create a system to standardize, integrate, and centralize data across agencies involved in oceanic research. Such research is critical to combating the environmental problems of ocean-based threats, biodiversity loss, and climate change. The IOOS system will not need to be built from the ground up. Elements of the existing IOOS system will be incorporated into the functional IOOS program design to successfully implement this act.

The program design outlined in this report utilizes the organizational structure existing within NOAA and the RAs, while creating a new Committee for oversight. This

program design is based on the components of administration, oversight and enforcement, and science and technology. These components have been integrated into the IOOS through the certification process, grants and contracts management and the creation of the data management and communications system. The latter process is the most important of the three components due to deficiencies of the existing system. This system is integral to creating a system to standardize, integrate, and centralize current and future ocean data in accordance with the core variables to ensure the data is available to the organizations and institutions involved in oceanic research. The successful implementation of the program will require staffing the organization and the creation of a budget, performance measurements, and a master calendar outlining implementation tasks.

The implementation of all these elements will lead to the creation of a functional nationwide IOOS system capable of being integrated into the GEOSS and meeting the goals stated in the Integrated Coastal and Ocean Observation System Act of 2009.

When the IOOS is effectively implemented, it will help to improve communication among the multiplicity of entities collecting ocean data. The integrated information will be a public good used by decision and policy makers in safeguarding our natural heritage and precious resources, and in finding measurable, science-based solutions to help with mitigation of and adaptation to environmental problems like biodiversity loss, climate change, and ocean-based threats. This vision of improved management cannot be realized without a step-by-step plan for the program design, staffing, budget, task calendar, and performance management. The compilation of this report represents the vital steps toward implementing such a system, and with this, we can begin our work.

APPENDIX A: COMPONENTS OF THE PROGRAM'S ORGANIZATIONAL STRUCTURE

Participating Agencies

NORLC:

- NOAA
- Minerals Management Service
- National Aeronautics and Space Administration
- National Science Foundation
- Environmental Protection Agency
- U.S. Geological Survey
- U.S. Navy, Army, and Coast Guard
- Office of Management and Budget
- Office of Science and Technology Policy
- Department of Energy
- Department of Homeland Security
- Department of State, Bureau of Oceans and International Environmental and Scientific Affairs
- Defense Advanced Research Projects Agency

COMMITTEE:

- NOAA
- Minerals Management Service
- National Aeronautics and Space Administration
- National Science Foundation
- Environmental Protection Agency
- Marine Mammal Commission
- U.S. Arctic Research Commission
- U.S. Army Corps of Engineers
- U.S. Coast Guard
- U.S. Geological Survey
- Office of Science and Technology Policy
- Office of Management and Budget
- Office of Naval Research
- Department of Energy
- Department of Homeland Security
- Department of the Interior
- Department of State
- Defense Advanced Research Projects Agency

APPENDIX B: FEATURES OF THE PROGRAM DESIGN

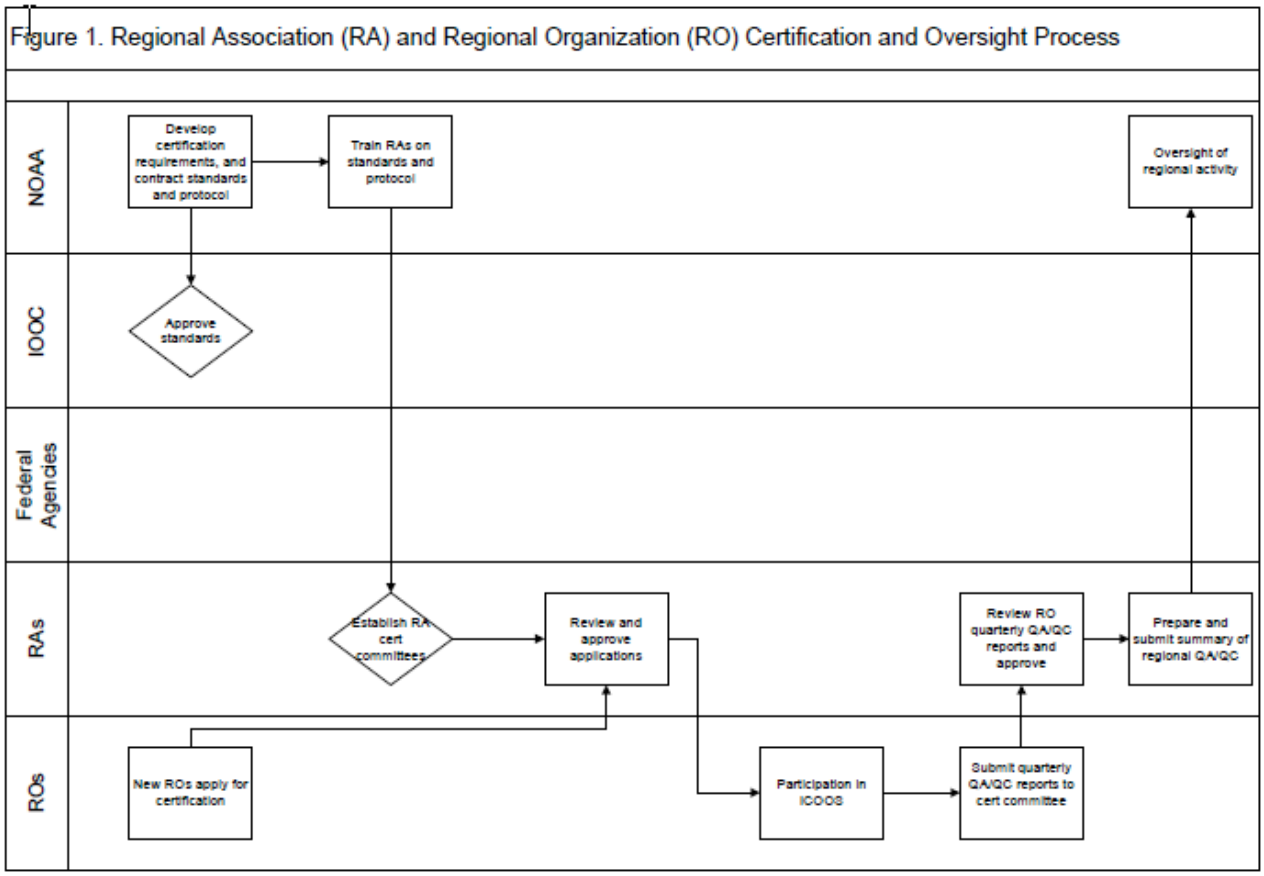


Figure b-1: Regional Association (RA) and Regional Organization (RO) Certification Process.

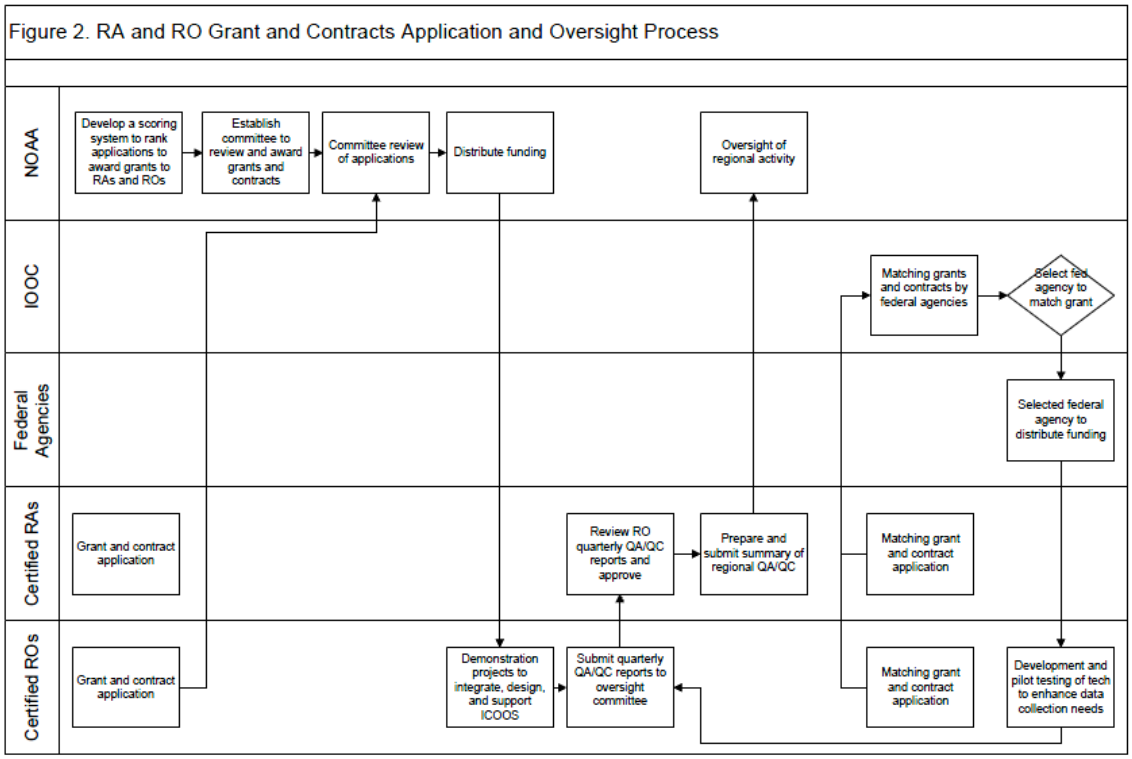


Figure b-2: RA and RO Grant and Contracts Application Process.

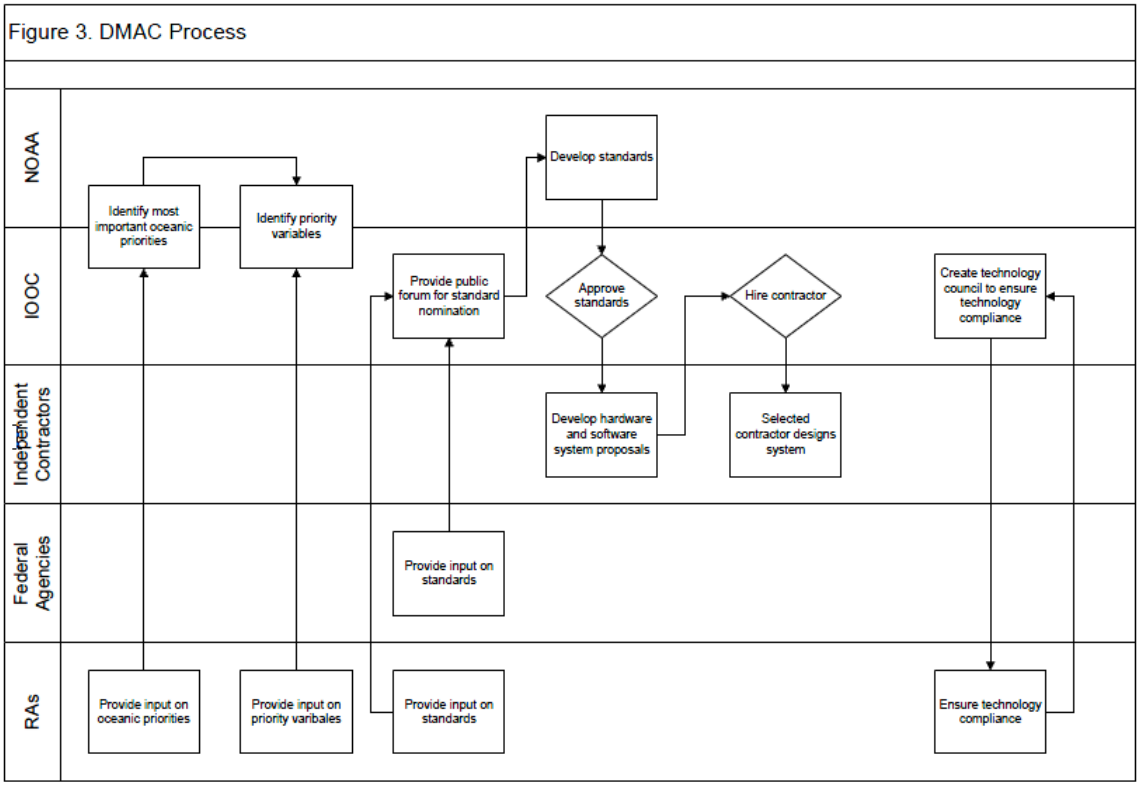


Figure b-3: DMAC Implementation.

APPENDIX C: KEY POSITIONS

KEY POSITIONS[6]

Administrator – The Administrator position within the IOOS program is the Administrator of NOAA and the Undersecretary of Commerce for Oceans and Atmosphere. As such, the Administrator is responsible for the implementation and administration of the IOOS in consultation with the NORLC, the Committee, other federal agencies that maintain portions of the IOOS, and the regional information coordination entities (i.e., RAs and ROs). Duties the Administrator will oversee include establishment of an Integrated Ocean Observing Program office within NOAA; implementation of policies, protocols, and standards approved by the NORLC; promulgation of program guidelines and requirements to certify RAs in the IOOS; administration of the grant/contract management system; development of a periodic evaluation process for the IOOS; and implementation of an education and outreach program. Salary range: 117,000 – 177,000 USD/year.

National Ocean Service Assistant Administrator – The Assistant Administrator will act with the Administrator of NOAA with regard to the direction and administration of the National Ocean Service (NOS) activities in conjunction with NOAA. Specifically, the Assistant Administrator will assist in the development and oversight program implementation and services in physical, biological, geophysical, and chemical oceanography to understand, assess, and establish information related to the IOOS program. The Assistant Administrator must undertake assignments to develop and recommend new or modified policies and programs in areas that are complex scientifically and have a politically sensitive nature. This work will require the Assistant Administrator to work with the Administrator in defining objectives and work with NOAA in developing the substance of NOS programs to further support IOOS. It is the Assistant Administrator's duty to keep up on new legislative and technological developments and problems that have an impact on the NOS program. Salary range: 102,000 – 133,000 USD/year.

Director – The Director of NOAA's IOOS program is responsible for management and coordination of NOAA's efforts in the IOOS. The Director directly manages a staff of approximately 20 project managers, analysts, and specialists to facilitate intra- and interagency communication and collaboration. Duties include developing and overseeing the implementation of programs and services required for coastal and ocean

[6] Position descriptions available at www.usajobs.gov were referenced when developing key position descriptions.

data collection; staying aware of new legislation and technological developments and problems that may impact the IOOS; working with other federal agencies to collaborate on ocean research, and providing policy-level authoritative representation to intergovernmental, national, and international councils and meeting concerning NOAA's interests in coastal and ocean management. Salary range: 117,000 – 177,000 USD/year.

Chief, Operations Division – The Chief of the Operations Division is responsible for the day-to-day operations of NOAA's IOOS program. The Chief of the Operations Division reports directly to the Director in addition to managing lower-level staff. Duties mirror those of the Director and include administering and managing the initial data integration framework, coordinating this framework with the regional observing systems, and then facilitating data dissemination for coastal and ocean modeling and analysis. Salary range: 102,000 – 133,000 USD/year.

Chief, Regional and External Affairs Division – The Chief of the Regional and External Affairs Division is responsible for coordination efforts between RAs and ROs conducting coastal and oceanic research and/or collecting coastal and oceanic data. Duties include facilitating communication between the agencies to ensure consistency across data collection methodologies and quality control of data. The Chief of the Regional and External Affairs Division reports directly to the Director of NOAA's IOOS program in addition to managing lower-level staff. Salary range: 102,000 – 133,000 USD/year.

IT Director – The IT Director is responsible for the management of the IT Team. The IT Director will need to work with the IT Specialists to develop and implement resources and programs to work within the IOOS program. Duties will include planning, scheduling, and overseeing the installation of new and updated software; managing user accounts and access to system resources, resolving problems for IT users in external offices; determining long- and short-term hardware needs and configurations, ordering equipment, installing and configuring hardware; and providing user assistance and expertise for the storage retrieval, reporting, and integration of different types of data. Salary range: 102,000 – 133,000 USD/year.

IT Specialists – The IT Specialists of NOAA's IOOS program are responsible for the operating system and associated subsystems working with ICOOS. The Specialists will provide system-level support for the ICOOS and its hardware and software tools, which include installation, configuration, and maintenance of the system. Specialists' duties mirror those required for the IT Director. Salary range: 53,000 – 76,000 USD/year.

Quality Assurance/Quality Control Officer – The Quality Assurance/Quality Control Officer is primarily responsible for identifying, analyzing, and developing improvements in the implementation of NOAA's IOOS program. Responsibilities include ensuring that the ROs adhere to the data collection guidelines set forth under the certification requirements. Salary range: 53,000 – 76,000 USD/year.

Senior Physical Scientist – The Physical Scientist will initiate, lead, and execute research and development projects within IOOS development and production. The Physical Scientist will perform state-of-the-art climate and ecosystem research that support a broad range of oceanographic observations to be used within IOOS. Desired candidates for this position have a strong post-graduate background in physical oceanography or related fields. Physical Scientists must have at least 10 years of experience working in fields relevant to understanding physical characteristics and processes of oceans, as well as the effect of climate change on these processes. Senior Scientists are responsible for the management of the lower-level Junior Scientists in aiding in the improvement of IOOS program and also are a key element in obtaining more funding for research projects to be conducted properly. Salary range: 102,000 – 133,000 USD/year.

Associate Physical Scientist – The Associate Scientist will work with the Senior Physical Scientists in conducting research projects to aid in the data collection and implementation process of IOOS. Ideal candidates for this position must have a Ph.D. in Climate/Physical Oceanography or related field, and a minimum of five years of relevant post-doctoral research experience. Salary range: 53,000 – 76,000 USD/year.

Senior Grant/Contract Administrator – The Senior Grant/Contract Administrator will be responsible for management of IOOS grant and contract activities. The Senior Administrator will also assist NOAA or RAs in strategically developing and adapting contract and grant processes based on ongoing research and operations. S/he will select the most effective structures for contractual agreements for contracts, grants, and other procurement-related documentation. In addition, the position will require the ability and experience to prepare product liability and risk guidelines and demonstrate skills of contract negotiation. This position requires extensive knowledge of, and 10 years experience with, contract law as well as an LLM degree. Salary: 90,000-95,000 USD/year.

Mid-level Grant/Contract Administrator – The Mid-level Grant/Contract Administrator will be responsible for assisting Senior Administrators with selecting appropriate contract and grant structures. The Mid-level Administrator must be well versed and have at least years of experience with contract law and contract negotiation. The Mid-level Administrator must also have familiarity with preparing tender documents and

Request for Proposals. S/he will communicate performance standards to contractors and evaluate outcomes. In addition, s/he will evaluate bids and prioritize potentially successful contractors, perform grant and contract risk assessment, and have familiarity with contract type identification. The Mid-level Administrator must have an MPA or LLM, with specializations in Atmospheric, Earth Sciences or related. Salary: 70,000-75,000 USD/year.

Junior Grant/Contract Administrator – The Junior Grant/Contract Administrator will be responsible for drafting invitations to bids and processing the first phase of bid responses. In addition, the Junior Administrator must perform duties as requested by mid-level and senior- level administrators. The Junior Administrator must have familiarity with contract type identification. A BA or BS in a related field is required. Salary: 35,000-40,000 USD/year.

APPENDIX D: BREAKDOWN OF THE BUDGET

Program Component	Admin/Office Operations	Oversight and Planning	Technical Operations (DMAC)	Regional Communications	Total (in USD)
Salaries and Wages[1]	360,000	900,000		990,000	2,250,000
Rent[2]	576,000				576,000
IT Services[3]	450,000				450,000
Contract Services[4]			2,176,000		2,176,000
Equipment/Supplies	50,000				50,000
Travel/Related Expenses[5]	300,000				300,000
Expanding Existing Federal Programs[6]		40,000,000			40,000,000
DMAC Design and Software[7]			25,000,000		25,000,000
Training[8]	180,000				180,000
Regional Grants (Develop Observing Systems)[9]				50,000,000	50,000,000
Education/Outreach[10]				2,500,000	2,500,000
Performance Review[11]		500,000			500,000
Total Projected Expenses	**1,916,000**	**41,400,000**	**27,176,000**	**53,490,000**	**123,982,000**
Deficit					**-96,482,000**

APPENDIX E: PERFORMANCE MANAGEMENT INDICATORS

Table e-1: 100% of all ROs Certified within Five Years

Year	Percentage of certified Regional Organization
1	10%
2	20%
3	45%
4	70%
5	100%

Table e-2: 100% of the RO's indicate an average rate satisfaction rate of 4/5

Year	Satisfaction
1	10%
2	25%
3	45%
4	70%
5	100%

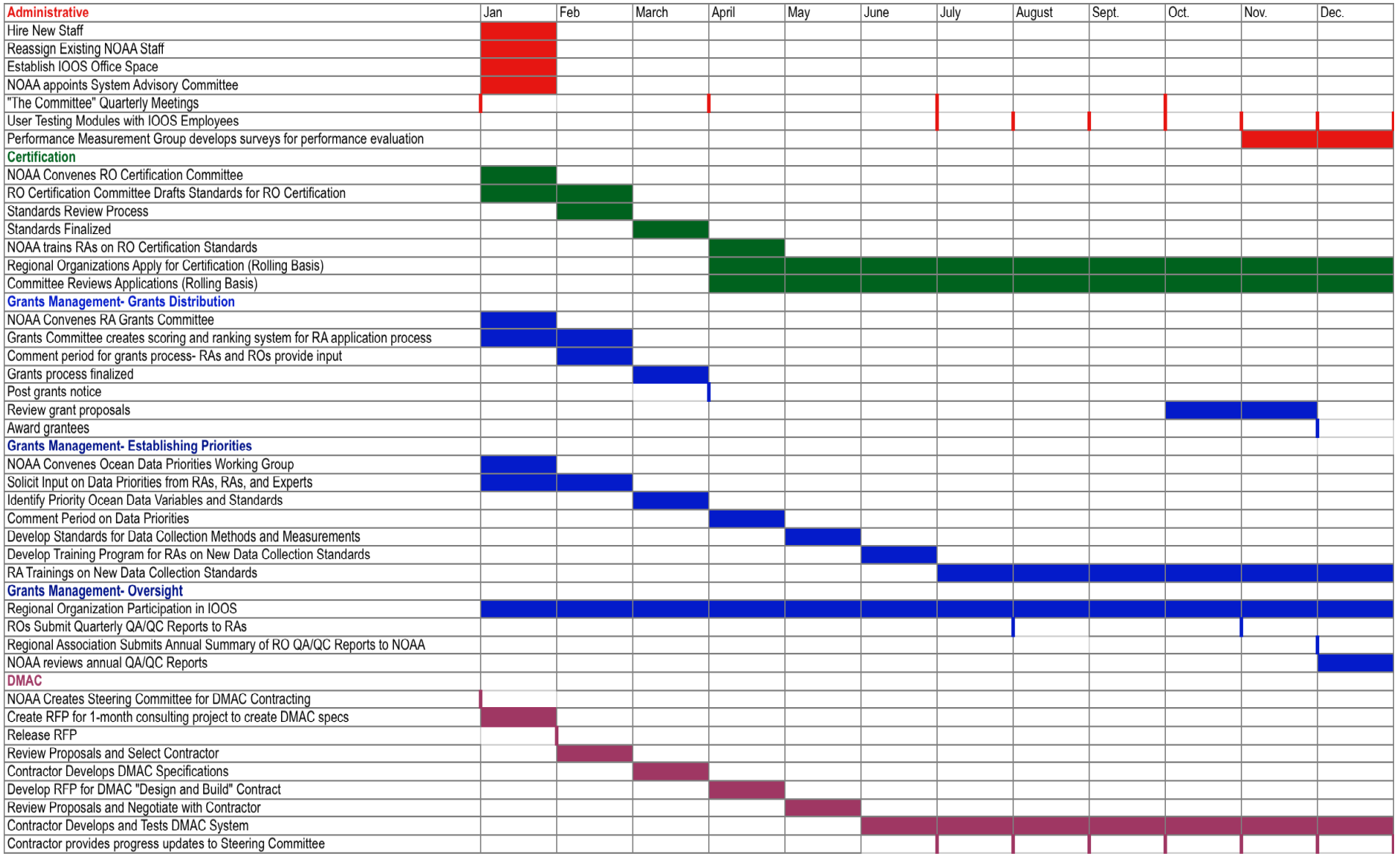
Table e-3: 75% New Technology in Every Certified RO within Five Years

Year	Percentage of New Technology
1	5%
2	10%
3	25%
4	40%
5	75%

Table e-4: Performance Management Indicators Summary Matrix

Design Components	Certification	DMAC	Grants & Contracts
Measurement	Number of certified RO's	Data accessibility & usefulness	Critical technologies
Collection	Sub-Committee monitors % of certified RO's	Likert Survey	Self Reporting Inventory of operational capacity
Reporting	Sub-Committee presents to Committee	Sub-Committee presents to Committee	Sub-Committee presents to Committee
Feedback	Sub-Committee & Committee streamline certification process	Committee & contractor update system	NOAA & The Committee reassess allocation

APPENDIX F: MASTER CALENDAR



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